

## **REMARKS/ARGUMENTS**

### **1. Election/Restriction**

The Examiner has indicated that a restriction is being made as follows:

1. Claims 1 – 21, drawn to a method for making an extreme ultraviolet optical element, classified in class 65, subclass 17.2 and
2. Claim 22, drawn to titania-containing silica glass body, classified in class 359, subclass 350

Applicants confirm the election made during a telephone conversation with the Examiner on August 23, 2006 to elect the claims of group 1, claims 1 – 21. Claim 22 is hereby withdrawn, without traverse, as a result of the restriction requirement, with reservation of applicants' rights to file a division application based on the non-elected present claim and any addition claims as may be added at the time of filing the divisional application.

### **2. Claims**

Claims 1 – 22 remain in this application. Claim 22 has been withdrawn as a result of the restriction requirement. Claims 1-21 remain open to prosecution.

The independent claims remaining in the application are claims 1 and 20. Claims 2-19 depend on claim 1 either directly or indirectly through an intermediate dependent claim. Claim 21 depends on claim 20.

Claim 1 has been amended, incorporating the subject matter of claims 2 and 3. Claims 2 and 3 have been cancelled. The amendment to claim 1 limits the powder to an amorphous titania-containing silica powder made from organometallic precursors by the flame hydrolysis method and in which the silica and titania therein are mixed on an atomic scale. Support for this amendment is found in the cancelled claims 2 and 3 and in the Specification at Paragraph [0019] lines 6-7 (re the atomic scale mixing).

### **3. Drawings**

Applicants thank the Examiner for indicating in the accompanying form PTO-948 that the formal drawings previously submitted have been approved.

#### 4. § 102 Rejections

The Examiner has rejected claims 1 and 12 under 35 U.S.C. § 102(e) as being anticipated by Clasen, et al (2002/0026810). Specifically, the Examiner states:

“Clasen et al. disclose a method comprising providing an aqueous sol including a solid phase of titania-containing powder, forming the sol into a titania-containing silica shaped gel having a homogeneous distribution of titania ([0031], [0033], [0034], and [0047]), drying the gel ([0048]), and heating to form a glass body ([0041]). Regarding claim 12, Clasen et al. disclose the further mixing of the titania containing silica powder with an alkoxide containing titanium, as well as an alkoxide containing silica ([0034], [0043]), as indicated by the mixtures thereof.”

Applicants traverse the rejection.

**First**, regarding claim 1, applicants submit that Clasen et al. (“Clasen”) does not anticipate the claimed invention because there is no identity of elements between Clasen and the claimed invention. Clasen claims the use of a combination of primary and secondary components to make a silica-titania glass. Applicants use only a single primary component.

**Second**, applicants, as claimed in their claim 1, use only a single primary component applicants submit that Clasen et al. (“Clasen”) does not anticipate the claimed invention because there is no identity of elements between Clasen and the claimed invention. Clasen discloses the use of a silica powder, silica-titania powder or titania powder, and that contains by way of a secondary component a titanium-containing component that is converted into amorphous silica (see the Abstract, Paragraph [0034] and claim 1). The Clasen invention thus requires the presence of the secondary titanium (only) containing component. This secondary component is neither required by the present invention nor as claimed by claim 1.

Regarding claim 12, additional components can be used as set forth in amended claim 12, but these are not required. If they are used, then both must be used and not just one as is the case with Clasen. In addition, applicants submit that claim 12 is patentable for depending on a patentable base claim not anticipated by Clasen.

Therefore, applicants submit that Clasen does not anticipate the claimed invention because Clasen requires the presence of the single titania alkoxide secondary component when the powders are mixed.

**Third**, Applicant's invention as claimed in claim 1 claims the use of a single component, an amorphous silica-titania powder. The use of a secondary component, as required by Clasen, is more complex than the use of only a silica-titania powder to prepare a sol and further can lead to inhomogeneities because the liquid of the sol will migrate during drying. As a result the concentration of the liquid can be different at different localized levels depending on the pore structure of the powder. As a result, when the sol is completely dried there can be inhomogeneities on a scale that is undesirable for application such as EUVL applications. Diffusion of titania in a silica-titania glass is slow and it will not result in a product that has the micron scale homogeneity needed for EUVL applications. If a combination of silicon and titania alkoxides are used as described in claim 12 this problem can be overcome to a great extent and the final material has the required homogeneity.

## **5. §103 Rejections**

A. The Examiner has rejected claims 2 – 5 under 35 U.S.C. §103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Maxon, et al (5,970,751) for reasons set forth in the Office Action. Applicants traverse the rejection.

**First**, in the Office Action on page 5, lines 9-11, the Examiner states that Maxon teaches forming a silica-titania powder which is collected in a cup and used for further processing. As explained below, this is only partially true. The powder is formed and collected in a cup, but as it is collected it is processed into glass. Maxon does not teach collecting powder as powder and using the powder in a separate processing step. Basically, Maxon is a one step process in that all operations are done almost simultaneously in a single furnace. No usable powder is produced by Maxon, nor does Maxon teach that a powder can be produced and used in a sol process to make a glass boule or article.

**Second**, applicants submit that claims 2-5 are patentable over the combination because Clasen in view of Maxon. The Clasen process requires the use of a titania alkoxide component in combination with silica powder, silica-titania powder or titania powder. The materials are all suspended and the

suspension is molded. Maxon describes a flame hydrolysis method in which silica and titania precursors are combusted in a flame in a furnace at temperatures that are sufficiently high so that when the resulting powder is laid down in the cup 42 (see Figure and column 2, line 59, the powder is immediately/simultaneously melted to form the boule. Glass production by this method has the disadvantage of having inhomogeneities known as striae being formed during the lay-down process. That is, as one would go from top to bottom through the boule one can find variations in titania content as one proceeds from point to point. These inhomogeneities or striae are on a sub-millimeter scale and lead to mid-spatial frequency roughness during polishing. Additionally, low frequency CTE changes can occur and these also are undesirable.

The present invention teaches the use of an amorphous silica-titania powder, collection of the powder and subsequent processing of the powder to form a silica-titania glass article. Applicants do teach that flame hydrolysis is advantageous for forming the powder, but they do not teach what Maxon teaches; namely, directly formation of the glass boule

**Third**, even though Clasen mentions forming a silica-titania powder via flame hydrolysis in Paragraph [0007] and Maxon mentions forming a glass boule using flame hydrolysis method (with direct and simultaneous consolidation), the use of any powder formed by any method would still require that one use the Clasen secondary component. There is no teaching in Clasen that this secondary component can be omitted. Maxon is a totally different process from Clasen or the claimed invention.

Fourth, Clasen and Maxon are completely different processes. The former is a sol process in which an intermediate body is formed which is then consolidated to a glass and the latter is a direct process in which the glass is formed as the material is laid down in the cup. There is no teaching in Clasen that one can use the process of Maxon and there is no teaching in Maxon that the powders can be collected and formed into a glass article via a sol process in the absence of an additional titania alkoxide component.

**Fifth**, claims 2-5 are dependent claims depending on claim 1. Having shown that claim 1 is not obvious and is patentable over the combination of Clasen

and Maxon, applicants submit that claims 2-5 are patentable for being dependent, either directly or indirectly, on an allowable independent claim.

Therefore, in view of all the foregoing facts and arguments, applicants submit that the combination of Clasen and Maxon do not teach or suggest the claimed invention.

- B.** The Examiner has further rejected claims 6, 7, 10, and 11 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, in view of Maxon, et al, as applied to claim 4 above, and further in view of Nordberg (2,236,059) for reasons set forth in the Office Action. Applicants traverse the rejection.

**First**, applicants incorporate by reference all the arguments set forth above in Section 5A with regard to Clasen in view of Maxon. The addition of Nordberg to the combination does not change the analysis. Nordberg teaches using flame hydrolysis to prepare a silica-titania glass which is deposited on a bait. The bait is similar to the cup of Maxon in that it is the collection point for the powders produced. The material collected on the bait is called a preform. After collection is complete, the preform is heated to a consolidation temperature of approximate 1600 °C to form a glass. Nordberg is thus similar to Maxon and dissimilar to Clasen which uses a sol process containing a secondary component in addition to a silica-titania powder.

There is no teaching in Nordberg that the perform prepared therein can be used in a sol process. To do so one would have to breakup and grind the preform and this would introduce impurities from the grinding process that could change the CTE of a consolidated glass made from the Nordberg preform material.

**Second**, claims 6, 7, 10, and 11 are dependent claims depending, directly or indirectly, on claim 1. Having shown that claim 1 is not obvious and is patentable over the combination of Clasen, Maxon and Nordberg, applicants submit that claims 6, 7, 10, and 11 are patentable for being dependent, either directly or indirectly, on an allowable independent claim.

Therefore, in view of all the foregoing facts and arguments, applicants submit that the combination of Clasen and Maxon in further view of Nordberg does not teach or suggest the claimed invention.

- C. The Examiner has also rejected claim 9 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, in view of Maxon, et al, and Nordberg, as applied to claim 4 above, in further view of Fujiwara, et al (6,587,262) for reasons set forth in the Office Action. Applicants traverse the rejection.

**First**, referring to Paragraph [0025], an inventive feature of the method of the invention as exemplified by claim 9 is its ability to produce the sizes needed for EUVL articles such as photomasks which have dimensions of 6"x6"x1/4" (approximately 15 cm x 15 cm x 0.6 cm). Sol-gel processes are typically limited to smaller sized articles of less than 10 cm due to the time required, days to weeks, for solvent exchange or drying. As explained in Paragraph [0025], using the present invention larger cylinders of shaped gel can be made which after drying and consolidation into a glass body can be flowed into a larger diameter cylinder thus allowing for production of elements for EUVL and other applications in a reasonable time.

**Second**, Fujiwara is cited solely for teaching that the glass body of dimensions of about 7 cm diameter by 26 cm length that can be finished and pressed into a body having a diameter of 23 cm.

Applicants submit that while Fujiwara may teach such a body, claim 9 is patentable over the combination of Clasen, Maxon, Nordberg and Fujiwara for being dependent on an allowable base claim.

**Third**, applicants submit that the cited combination of art is excessive and is made without teaching and suggestions therein that such combinations can be made. That is, combining Clasen without its secondary component with a powder of Maxon and Nordberg and pressing a glass formed therefrom to make an article having a diameter similar to that of Fujiwara.

Fourth, Applicants submit that claim 9 is allowable for depending, indirectly, on an allowable base claim and allowable intermediate claims.

Therefore applicants submit that it is proper for the Examiner to withdraw the rejection of claim 9.

- D. The Examiner has also rejected claim 13 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Maxon, et

al, Nordberg, and Yoldas (4,278,632) for reasons set forth in the Office Action. Applicants traverse the rejection.

Claim 13 invention is present to emphasize the high degree of control of the composition that can be obtained in the sol-gel process because 100% of the powder is collected. In direct flame hydrolysis the differential vapor pressures of silica and titania materials lead to differential capture in the formed glass body and consequently differential CTE distributions and differential polishing behaviors. This is not the case in processing of powders when only 100% of the powders are collected.

Additionally, applicants submit that claim 13 is allowable for ultimately depending on an allowable base claim.

Consequently, applicants submit that it is reasonable for the Examiner to withdraw the rejection of claim 13.

E. The Examiner has also rejected claim 14 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Seiko Epson Corp. (Derwent Abstract of JP 62252330, the '330 publication) for reasons set forth in the Office Action.

**First**, applicants submit that the combination does not teach or suggest the claimed invention. In particular Clasen utilizes a second titania (only) alkoxide component; and the '330 publication teaches separate silica and titania sols, but not a silica-titania sol. After mixing and upon drying the mixtures of the '330 do not have silica and titania distributed on an atomic scale relative to one another as claimed in claim 1. The '330 publication describes a system in which the dried material can have locally differential titania distributions, which are detrimental to materials for EUVL applications.

**Second**, applicants submit that claim 14 is allowable for depending on an allowable base claim.

Consequently, applicants submit that it is reasonable for the Examiner to withdraw the rejection of claim 14.

F. The Examiner has also rejected claims 15-16 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Kirkbir et al (US 5,473,826) for reasons set forth in the Office Action. Applicants traverse the rejection.

Applicants submit that claims 15-16 are allowable for depending on applicants' allowable claim 1, the reason for whose allowability have been set forth above and are incorporated herein by reference.

Therefore, applicants submit that it is proper for the Examiner to withdraw the rejection of claims 15-16.

G. The Examiner has also rejected claim 17 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Kirkbir et al (US 5,473,826) in further view of Blackwell et al. (US 5,154,744) for reasons set forth in the Office Action. Applicants traverse the rejection.

Applicants submit that claim 17 is allowable for depending on applicants' allowable claim 1 through allowable intermediate dependent claims. The allowability of claim 1 has been set forth above and is incorporated herein by reference.

Therefore, applicants submit that it is proper for the Examiner to withdraw the rejection of claim 17.

H. The Examiner has also rejected claim 18 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Kirkbir et al (US 5,473,826) in further view of Yoldas (US 5,428,826) for reasons set forth in the Office Action. Applicants traverse the rejection.

Applicants submit that claim 18 is allowable for depending on applicants' allowable claim 1 through allowable intermediate dependent claims. The allowability of claim 1 has been set forth above and is incorporated herein by reference.

Therefore, applicants submit that it is proper for the Examiner to withdraw the rejection of claim 18.



- I. The Examiner has also rejected claim 19 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Nakajima (English Abstract of JP 63123835) for reasons set forth in the Office Action.

Applicants traverse the rejection.

Applicants submit that claim 19 is allowable for depending on applicants' allowable claim 1. The allowability of claim 1 has been set forth above and is incorporated herein by reference.

Therefore, applicants submit that it is proper for the Examiner to withdraw the rejection of claim 17.

- J. The Examiner has also rejected claim 19 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, as applied to claim 1 above, in view of Maxon et al, Nordberg et al and Nakajima (English Abstract of JP 63123835) for reasons set forth in the Office Action. Applicants traverse the rejection.

Applicants submit that claim 19 is allowable for depending on applicants' allowable claim 1. The allowability of claim 1 has been set forth above and is incorporated herein by reference.

Therefore, applicants submit that it is proper for the Examiner to withdraw the rejection of claim 17.

- K. The Examiner has also rejected claims 8 and 21 under 35 U.S.C. 103(a) as being unpatentable over Clasen, et al, in view of Maxon et al, Nordberg et al and Kirkbir et al and in further view of Hrdina (Proceeding of SPIE, Vol. 5037) for reasons set forth in the Office Action. Applicants traverse the rejection.

Applicants submit that claims 8 and 21 are allowable for depending, either directly or indirectly on an allowable base claim. Applicants deem claim 20 as allowable because it has not been rejected. However for completeness, with regard to claim 20 applicants incorporate by reference all comments above regarding claim 1, and thereby conclude that claim 20 is allowable. Consequently, applicants submit that claim 21 is allowable for depending on an allowable base claims. The Hrdina does not describe how glass is prepared.

Therefore, applicants submit that it is proper for the Examiner to withdraw the rejection of claims 8 and 21.

**6. Conclusion**

Based upon the above amendments, remarks, and papers of records, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Applicant believes that no extension of time is necessary to make this Reply timely. Should applicant be in error, applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Walter M. Douglas at 607-974-2431.

11 December 2006  
Date

CERTIFICATE OF MAILING (37 CFR 1.8a)	
I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Mail Stop: Non-Fee Amendments, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on: 12-11-2006	
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